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SCIENCE

NEW YORK, SEPTEMBER 4, 1891.

THE FUTURE OF SYSTEMATIC BOTANY.¹

THE address of Vice-President Coulter was a departure from the custom of presenting either an interesting bit of research or a summarized view of information concerning some subject. The speaker invited the attention of the section to an ancient department of work. The ancient history of systematic botany is too well known, he said, to need even brief repetition, but the one desire which runs with increasing force through it all is to reach eventually a natural system of classification. At first, from necessity, plants were simply systematically pigeon-holed for future reference, and those who could thus dispose of plants were known as "systematic botanists," an appellation proper enough, but one unfortunately not having sufficiently outgrown its original application. The unfortunate result of this early necessity of so rigidly systematizing facts and thus rendering them accessible was to make the pigeon-holes as permanent as the facts they were intended temporarily to contain.

As soon as knowledge justified the attempt, "natural systems" of classification began to be proposed; and one natural arrangement has succeeded another, from that day to this, until in those of to-day we have presented simply what the earliest contained, viz., the expression of man's knowledge of affinity, the difference being a slowly diminishing amount of artificial padding.

Systematic botany, as formerly understood, has probably done all that it could, unaided, in the natural arrangement of plants. It could indefinitely juggle with sequences and nomenclature, but this is of secondary importance when the real purpose of systematic botany is considered. But it was not left without aid, and a group of new departments was made possible by the microscope and the unexampled progress of powers and manipulation. The study of the cell and of nascent and mature organs, and the recognition of plants as living things that are the resultant of the interplay of internal and external forces, have revivified the ancient mummy called botany, and have made it a living thing, capable of endless development.

Some one has said that "the highest reach of the human mind is a natural system of classification." This simply means that when the results of all departments of botanical work are well in hand, then the systematists will be in a position to put on a sure foundation the structure they have always been planning. The real systematic botany, therefore, is to sum up and utilize the results of all other departments, and its work is well-nigh all in the future. It is bound to be the last expression of a human thought with reference to plant life, just as it was the first. The systematic botany which deals with genetic characters and recognizes the fact that every plant is a living thing, with a history and all degrees of consanguinity, and that the final form of every natural classification must be to approximate to the order of descent, is in its early infancy.

¹ Abstract of an address before the Section of Biology of the American Association for the Advancement of Science, at Washington, D.C., Aug. 19-25, 1891, by John M. Coulter, vice-president of the section.

The position then taken by the speaker was that for the systematists of to day and of the future there must be three distinct lines of work, related to each other in natural sequence in the order presented, and each turning over its completed product to the next.

The preliminary phase of systematic botany, the collection and description of plants, is that which most frequently stands for the whole in the popular mind. The speaker explained the disrepute into which it seems to have fallen in certain scientific quarters by the fact that this popular impression was resented. He spoke of the inspiring nature of the pursuit after new species, and said that it sometimes became almost a mania, or too attractive to the incompetent. But even this ancient kind of work sadly needs improvement. Many things besides the mere sporadic collection and recording of species should be included as legitimately belonging to this line of research. A plant is too often a text without any context, and is thus robbed of much of its significance. Nothing seems more unsystematic than field-work in systematic botany. All information that can be obtained in the field concerning species is the province of the collector to procure and of the taxonomist to record. The speaker protested against the search for species as for diamonds, as things solely valuable in themselves apart from their surroundings, and he urged the conversion of collecting trips into biological surveys. He expressed great gratitude to the noble army of self-denying pioneer collectors, but claimed that the time had now come when the same amount of labor could be expended to better advantage, and that a race of field-workers must be trained who shall follow their profession as distinctly and scientifically as the race of topographers. "In this centre of public scientific work in which we have met, devoted to obtaining the largest amount of information in regard to our material possessions, and with means commensurate with the largest plans, it seems an appropriate thing to urge a thoroughly equipped system of biological surveys. This subject is not a new one here, and steps have already been taken to organize some work of this kind, but I desire to voice the sentiment of this section in commanding all that has been done in this direction, and in urging that the organization be made more general and extensive."

In reference to the work of description, the speaker read an unpublished note of Professor Asa Gray, in which that distinguished botanist lamented the work of those who were incompetent. The speaker also expressed the opinion that the exclusive use of gross organs in the description of higher plants would be given up, and that the more stable, minute characters would prove valuable aids in studying diagnosis. A danger in the use of these minute characters was pointed out, viz., the tendency to use a single set of minute characters too far, and to make the fabric of a whole group conform to it. The character of a species is an extremely composite affair, and it must stand or fall by the sum total of its peculiarities and not by a single one. There is nothing that involves a broader grasp of facts—the use of an inspiration rather than a rule—than the proper discrimination of species.

"I have dwelt thus upon the work of collection and de-

scription both to magnify it and to indicate that its proper position is that of a preliminary phase in the study of systematic botany."

The work of searching for the affinities of great groups is the crying need of systematic botany to-day. The speaker called attention to the danger of magnifying the importance of certain periods or organs in indicating affinities, and summed up what was said under this head as follows: "I have thus spoken of the study of life-histories to indicate that its chief function lies in the field of systematic botany; to suggest that it take into account development at every period and of every organ, and so obtain a mass of cumulative evidence for safe generalization, and to urge upon those not thoroughly equipped great caution in publication."

The speaker spoke of the necessity of constructing a natural system with easy advance in the knowledge of affinities, as a convenient summary of information, a sort of mile-post, to tell of progress and to direct future effort. The concluding summary was as follows: "The points presented in this consideration of the third phase of systematic botany are that the last and highest expression of systematic work is the construction of a natural system, based upon the accumulations of those who collect and describe, and those who study life histories; that this work involves the completest command of literature and the highest powers of generalization; that it is essential to progress for a natural system to be attempted with every advance in knowledge, and that all the known facts of affinity, thus brought within reach, should be expressed in all systematic literature. In conclusion, I have but to say that I have attempted to indicate the true relation which exists among the different phases of systematic botany; to point out an affinity which there is danger of ignoring, and to maintain that all these departments of work, looking to the same end, are equally important, equally honorable."

THE FARMER AND TAXATION.¹

QUESTIONS of taxation have played a prominent part in the polity of English-speaking communities for many centuries, and they have not been without importance in the history of other civilized countries as well. A history of English taxation would be in no small part a history of the English people itself.

It was a quarrel about taxation between the nobles and King John which led to the granting of the Great Charter, and thus planted the seeds of modern constitutional government. English liberty indeed has been developed chiefly in connection with disputes about taxation. Charles I. owed the loss of his throne and of his head largely to his determination to levy such taxes as he pleased without consulting the great men of his realm. English obstinacy in regard to the principle of taxing the colonies led to the American Revolution and the disruption of the British Empire. It was at bottom a question of taxation which led to the French Revolution, and the turning and overturning of Europe which has hardly ceased even now. And the history of this century on the continent shows how fundamental tax questions are to the welfare and prosperity of modern nations.

Of late the question has become of even more importance, and has acquired a very different aspect from that of former centuries. The disputes about taxation were, down to a recent date, largely of a political nature. They turned, not so much on the amount of the tax or the manner in which it

should be levied, as upon the point who should say whether it should be levied at all or not. The rulers or ruling classes tried to keep the whole question within their own control, and those who were opposed to this were trying to get the right to vote or refuse taxes. Now every civilized country in western Europe and America vests the right to say what taxes should be levied, and how they shall be levied, in the people or their representatives. It is accepted as a definite principle that the people are the sole source of the authority to determine what taxes should be levied.

We have indeed always had that principle accepted in this country, to a greater or less extent, and in all its fulness, ever since the Revolution. People thought formerly that as soon as that principle was accepted tax problems would be solved. But it did not take long to find out how great an error this notion was. Hardly had the principle been accepted as a part of the fundamental law of the country when the representatives of the people found out that they were only at the verge, so to speak, of the question. The political side of the problem had been settled to a certain extent, but that only left room for the economic aspect to appear in sight, with a vast array of the most difficult questions. It soon became evident that under the systems of taxation in existence some people paid more than they ought to, and some paid less. Some classes were taxed but lightly or not at all and others very heavily. Then began the fight between the classes, between those exempted by law and those subjected by law to taxation. This conflict was slowly fought through, and now in nearly all civilized countries there are few classes exempted by law from taxation. But it was soon found that it was not necessary to exempt by law in order to take advantage of circumstances in such a way as to materially lighten one's burdens. Then began another struggle between the various classes as to which could shift the burden of taxation more completely, under the forms of law, to the shoulders of the other. The town was arrayed against the country, the producer against the consumer, the rich against the poor, the laborer against the capitalist, etc. We are still in the thick of this fight, and there is no sign of an end to it. It is raging in all countries alike. Our tax problems are not very different in some of their most important features from the tax problems of England, France, and Germany, and each of these countries can learn something from the experience, the successes and failures, of the others.

The problem is all the more difficult because, even if all parties were willing to do exactly the fair thing, we should still find it difficult to determine exactly what the fair thing is. Where you cannot obtain common consent as to what is fair and proper, we need not expect that private individuals will relax their efforts to get exemptions, and make laws under which they can escape what others may consider their fair share of taxation.

The matter is destined to become more rather than less important, and that from several reasons. In the first place the amount of money to be raised by taxation is destined to increase pretty steadily, if not very rapidly. This fact, of course, makes a bad system of taxation become worse with every increase of the amount. If, for example, we had in this country to raise only a small sum for public purposes, say ten million dollars in all, for federal, state, and local governments, it would not matter much how we raised it. We might have an income tax on all incomes over ten thousand dollars a year, or on all incomes of less than that, or a uniform tax on lands irrespective of their value, or even on polls; and while it might be very unequal, yet the whole

¹ Address before the Section of Economic Science and Statistics of the American Association for the Advancement of Science, at Washington, D.C., Aug. 19-25, 1891, by Edmund J. James, vice-president of the section.